85A OPTO<Customized for Finwing AirTitan)

Continuous current: 85A
Burst:100A
Battery cell: 2-6lipo/5-18NC

Program the following functions to fit your specific needs, which makes it very efficient and user friendly:

1. User programmable Brake Type (we recommend using brake for only folding props applications)
2. User programmable Battery Type (NiCd/NiMH ,LiPo ,LiFe)
3. User programmable Cut Off Voltage Threshold
4. User programmable Restore Factory Setup Defaults
5. User programmable Motor Timing (to enhance ESC efficiency and smoothness)
6. User programmable SBEC Voltage Output
7. User programmable Governor Mode (for helicopter applications)
8. User programmable Motor Rotation (forward/reverse)
9. User programmable Start Up Strength (for delicate gearbox and helicopter applications)
10. User programmable Low Voltage Cut Off Type (Reduce Power or Cut Off Power)

Settings:

1.Brake Type: Brake Off/Soft Brake/Mid Brake/Hard Brake

* **Brake Off**- Sets the propeller to freewheel when the throttle stick is at the minimum position.
* **Soft Brake** Sets the propeller to the 30% of the brake when the throttle stick is at the minimum position (Recommended for folding props).
* **Mid Brake** Sets the propeller to the 60% of the brake when the throttle stick is at the minimum position (Recommended for folding props).
* **Hard Brake** Sets the propeller to the 100% of the brake when the throttle stick is at the minimum position (Recommended for folding props).

2.Battery type: NiCad/NiMh /LiPo / LiFe

* **NiCad/NiMH** – Sets Low Voltage protection threshold for NiCad/NiMH cells.
* **LiPo** – Sets Low voltage protection threshold for LiPo cells and automatically detects the number of cells within the pack.
* **LiFe** – Sets Low Voltage protection threshold for LiFe cells.

Note: Selecting the NiCad/NiMH option for the battery type, triggers the ESC to automatically set the cutoff threshold to the factory default of 60%.The cutoff threshold can then be subsequently altered through the Low Voltage protection function, if required. The ESC will read the initial voltage of the NiCad/NiMh pack once it is plugged in and the voltage read will then be used as a reference for the cut off voltage threshold.

3.Cut Off Voltage Threshold(Low Voltage Protection Threshold):

2.8V/50%/ 3.0V/60%/ 3.2V/65%/No Protection

1) For Li-xx packs- number of cells are automatically calculated and requires no user input apart from defining the battery type. This ESC provides 4 setting options for the low voltage protection threshold ; 2.8V/ 3.0V/3.2V/No Protection. For example : the voltage cutoff options for an 11.1V/ 3 cell Li-Po pack would be 8.4V (Low)/ 9.0V(Med)/ 9.6V(High)

2) For Ni-xx/Life packs-low / medium / high cutoff voltages are 50%/60%/65% of the initial voltage of the battery pack.. For example: A fully charged 6 cell NiMh pack's voltage is 1.44V x 6=8.64V,when "LOW" cutoff voltage is set, the cutoff voltage is: 8.64V x 50%=4.3V and when "Medium" of "High" is set, the cutoff voltage is now 8.64V X 65%=5.61V.

4. Restore factory setup defaults:

Restore- Sets the ESC back to factory default settings;

Brake Type:	Brake Off
Battery Type:	LiPo with Automatic Cell detective
Cut Off Voltage Threshold:	3.0V/60%
Motor Timing:	Auto
SBEC Voltage Output	5.0V
Governor Mode :	RPM OFF
Motor Rotation :	Forward
Start Up Strength:	15%
Low Voltage Cut Off Type:	Reduce Power

5. Motor Timing : Auto, 2°, 8°, 15°, 22°, 30°

* Auto – ESC determines the optimum motor timing automatically.
* **2°, 8°** – Setting for most of in-runner motors.
* **15°, 22°** –Setting for motors with 6 or more poles.
* **30°** – Setting for motors with more poles.

In most cases, automatic timing works well for all types of motors. However for high efficiency we recommend the Low timing setting for 2 pole motors (general in-runners) and high timing for 6 poles and above (general out-runners). For higher speed, High timing can be set. Some motors require different timing setups therefore we suggest you to follow the manufacturer recommended setup

Note: Run your motor on the ground first after making any changes to your motor timing!

6. ESC OPTO without UBEC

7.Governor Mode (Heli Governor mode)

*** RPM OFF**

* **Soft Start :** For 1st Soft Start There will be a 8-second delay from start to full rpm;
  For 2nd Soft Start There will be a 18-second delay from start to full rpm;

Note: If the throttle is cut off after starting less 3 Seconds, then the next start will be as normal start. If the throttle is cut off after starting more than 3 Seconds, the next start will be as soft start.

- **Governor Mode 1 :** There will be a 23-second delay from start to full rpm;If lower the throttle to the 80% position of the full throttle or lower than 80% position, the RPM would be definitely changed , the lost RPM will be detected and compensated automaticly by the ESC that makes sure to keep the RPM at the same speed. (Note: This function is only for Low KV motor)
- **Governor Mode 2 :** There will be a 23-second delay from start to full rpm;If lower the throttle to the 80% position of the full throttle or lower than 80% position, the RPM would be definitely changed , the lost RPM will be detected and compensated automaticly by the ESC that makes sure to keep the RPM at the same speed. (Note: This function is only for High KV motor)

Note 1: If the throttle is cut off after starting less 3 Seconds, then the next start will be as normal start. If the throttle is cut off after starting more than 3 Seconds, the next start will be as soft start.

Note 2: Once the Governor Mode is enabled, the ESC's Brake and Low Voltage Cutoff Type settings will automatically be resetted to Brake Off and Reduce Power respectively, regardless of what settings they were previously set.

Note 3: Lower 50,000 turns is considered as Low KV motor,

100,000-200,000 turns is considered as High KV motor.

Formula : Pole's qty of motor x KV value x Voltage= Motor turns

For example: we test a 8 pole motor 1040KV with 6S Lipo, its turns will be 8x1040KVx25v=208,000 turns, so you can choose Governor Mode 2.

8.Motor Rotation: Forward/ Reverse

In most cases motor rotation is usually reversed by swapping two motor wires. However, in cases where the motor cables have been directly soldered the ESC cables, motor rotation can be reversed by changing the value of setting on the ESC.

9. Start Up Strength

*__Low__(10%-15%-20%) Sets ESC start up strength for the motors which needs low start up current

*__Mid__ (25%-30%-35%) Sets ESC start up strength for the motors which needs mid start up current

*__High__(40%-45%-50%) Sets ESC start up strength for the motors which needs high start up current

10.Low Voltage Cut Off Type : Reduce Power / Cut Off Power

* Reduce Power – ESC reduces motor power when the pre-set Low Voltage Protection Threshold value is reached.(recommended)
* Cut Off Power – ESC instantly cuts motor power when the pre-set Low Voltage Protection Threshold value is reached.

THE PROCEDURE AND INSTRUCTION OF THE PROGRAMMING BY TRANSMITTER

1. ENTERING THE PROGRAMMING MODE
2. SELECTING THE PROGRAMMABLE ITEM
3. SELECTING THE DESIRED VALUE OF THE PROGRAMMABLE ITEM
4. DISCONNECTING THE BATTERY PACK

1. ENTERING THE PROGRAMMING MODE

1).Switch your Transmitter ON and set the throttle stick to its maximum position.

2).Connect the battery pack to the ESC

3).Wait for about 2 seconds until you hear two short beeps (•• •• •• ••) confirming that the ESC has now entered the programming mode.

2. SELECTING THE PROGRAMMABLE ITEM

The Programming Mode is in Sequence, each Programmable Item is equivalent to an audible tone emitting for four times. You will hear 10 tones in a loop with the following sequence.When the desired tone for the Programmable Item is reached, move the throttle stick down to its minimum position. The motor will emit one special tone confirming the desired programmable item has been entered.

3. SELECTING THE DESIRED VALUE OF THE PROGRAMMABLE ITEM

The motor has been emitting sequentially. If the desired value of the programmable item is reached, set the throttle stick to its maximum position. The motor will emit one special tone confirming the new setting has been stored.

4. DISCONNECTING THE BATTERY PACK.

If you don't want to go on to programming, disconnect the battery pack directly. If you want to go on to programming, keep waiting to the next programmable item to select the value you need.

Note: You could also select the LED program card to program your desired function. Program card is as the option spare part, its programming procedure is described in the LED program card user manual.

THE TONES WILL BE HEARD IN SEQUENCE AS FOLLOWS:

1	Beep-	Brake Type (1 short tone)
2	Beep-Beep-	Battery Type (2 short tone)

3	Beep-Beep-Beep-	Cut Off Voltage Threshold (3 short tone)
4	Beep-Beep-Beep-Beep-	Restore Factory Setup Defaults (4 short tone)
5	Beep-----	Motor Timing (1 long tone)
6	Beep-----Beep-	SBEC Voltage Output (1 long tone 1 short tone)
7	Beep-----Beep- Beep-	Governor Mode (1 long tone 2 short tone)
8	Beep-----Beep- Beep- Beep-	Motor Rotation (1 long tone 3 short tone)
9	Beep-----Beep- Beep- Beep- Beep-	Start Up Strength(1 long tone 4 short tone)
10	Beep----- Beep-----	Low Voltage Cut Off Type (2 long tone)

Remark :One long tone "Beep-----"is equal to five short tone "Beep-".

Tone of value / Prog.Item	BEEP-	BEEP- BEEP-	BEEP- BEEP- BEEP-	BEEP- BEEP- BEEP- BEEP-	BEEP-----	BEEP----- BEEP-	BEEP----- BEEP- BEEP-	BEEP----- BEEP- BEEP- BEEP-	BEEP----- BEEP- BEEP- BEEP- BEEP-
Brake Type	Brake OFF	Soft Brake	Mid Brake	Hard Brake					
Battery Type	NiCd/NiMH	LiPo	LiFe						
Cut Off Voltage Threshold	2.8V/50%	3.0V/60%	3.2V/65%	No Protection					
Restore Factory Setup Defaults	Restore								
Motor Timing	Auto	2°	8°	15°	22°	30°			
SBEC Voltage Output									
Governor Mode	RPM OFF	1st Soft Start	2nd Soft Start	Governor Mode 1	Governor Mode 2				
Motor Rotation	Forward	Reverse							
Start Up Strength	10%	15%	20%	25%	30%	35%	40%	45%	50%
Low Voltage Cut Off Type	Reduce Power	Cut Off Power							

FOR Example : Setting the motor timing ----15°

1). Switch your Transmitter ON and set the throttle stick to its maximum position. Connect the battery pack to the ESC and wait for about 2 seconds until you hear two sets of audible tone (•• •• •• ••) confirming that the ESC has now entered the programming mode.

2). After hearing "Beep-----",put the throttle sticker to its minimum.

3). After hearing "Beep-Beep-Beep-Beep-" ,put the throttle sticker to its maximum, the motor will emits special tones confirming the new setting has been stored.

4). Disconnect the battery pack.

Using Your New ESC

Improper polarity or short circuit will damage the ESC therefore it is your responsibility to double check all plugs for proper polarity and first fit BEFORE connecting the battery pack.

Built-in Intelligent ESC Safety Functions

1. **Over-heat protection**: When the temperature of ESC exceeds 110 deg C, the ESC will reduce the output power to allow it to cool.
2. **Lost Throttle signal protection**: The ESC will automatically cut power to the motor when it detects a lost of throttle signal for 2 seconds.

POWERING UP ESC FOR THE FIRST TIME & SETTING THE AUTOMATIC THROTTLE CALIBRATION

The ESC features Automatic Throttle Calibration to attain the smoothest throttle response and resolution throughout the entire throttle range of your transmitter. This step is done once to allow the ESC to "learn and memorize" your Transmitter's throttle output signals and only repeated if you change your transmitter.

1.Switch your Transmitter ON and set the throttle stick to its maximum position.

2.Connect the battery pack to the ESC. Wait for about 2 seconds, the motor will beep for twice, then put the throttle in the minimum position, the motor will also beep, which indicates that your ESC has got the signal range of the throttle from your transmitter.

The throttle is now calibrated and your ESC is ready for operation.

NORMAL ESC START UP PROCEDURE

1. Switch your Transmitter **ON** and set the throttle to its **minimum** position.
2. Connect the battery pack to the ESC.
3. When the ESC is first powered up, it emits two sets of audible tones in succession indicating its working status.
   * The first set of tones denotes the number of cells in the LiPo pack connected to the ESC. (Three beeps (***)indicates a 3 cell LiPo pack while 4 beeps (****) indicates a 4 cell LiPo pack).
   * The second set of tones denotes Brake status (one beep(*) for Brake "ON" and two beeps (**) for Brake "OFF").

The ESC is ready for use now.

General Safety Precautions

Do not install the propeller (fixed wing) or drive pinion (helicopter) on the motor when you test the ESC and motor for the first time to verify the correct settings on your radio. Only install your propeller or pinion after you have confirmed that the settings on your radio is correct.

- Never use ruptured or punctured battery cells.
- Never use battery packs that are known to overheat.
- Never use short circuit battery or motor terminals.
- Always use proper insulation material for cable insulation.
- Always use proper cable connectors.
- Do not exceed the number of cells or servos specified by the ESC.

Wrong battery polarity will damage the ESC and void the warranty.

- Install the ESC in a suitable location with adequate ventilation for cooling. This ESC has a built-in over temperature cutoff protection feature that will immediately cut power to the motor once the ESC temperature exceeds the 230 Deg F/ 110 Deg C high temperature limit.
- Use only batteries that are supported by the ESC and ensure the correct polarity before connecting.
- Switch your Transmitter ON and ensure the throttle stick is in the minimum position before connecting the battery pack.
- Never switch your transmitter **OFF** while the battery is connected to your ESC.
- Only connect your battery pack just before flying and do not leave your battery pack connected after flying.
- Handle your model with extreme care once the battery pack is connected and keep away from the propeller at all times. Never stand in-line or directly in front of any rotating parts.
- Do not immerse the ESC underwater or allow it to get wet while powered up.
- Always fly at a designated flying site and abide by the rules and guidelines set by your flying club.

Trouble Shooting

Trouble	Possible Reason	Action
Motor doesn't work, there`s no audible tones while servos work properly after powering up ESC.	The ESC throttle calibration has been not set up.	Set up the ESC throttle calibration.
Motor doesn't work and no audible tone emitted after connecting the battery. Servos are not working either.	Poor/loose Connection between battery Pack and ESC.	Clean connector terminals or replace connector.
	No power	Replace with a freshly charged battery pack
	Poor soldered connections (dry joints)	Re-solder the cable connections
	Wrong battery cable polarity	Check and verify cable polarity
	ESC throttle cable connected to receiver in the reverse polarity	Check the ESC cable connected to the ESC to ensure the connectors are in the correct polarity.
	Faulty ESC	Replace ESC
Motor runs in reverse rotation	Wrong cables polarity between the ESC and the motor.	Swap any two of the three cable connections between the ESC and the Motor or access the Motor Rotation function via the ESC programming mode and change the pre-set parameters.
Motor stops running in flight.	Lost throttle signal	Check proper operation of the radio equipment. Check the placement of the ESC and the Receiver and check the route of the receiver's aerial and ESC cables to ensure there is adequate separation to prevent RF interference .Install a ferrite ring on the ESC's throttle cable.
	Battery Pack voltage has reached the Low Voltage Protection threshold.	Land the model immediately and replace the battery pack.
	Possible bad cable connection	Check and verify the integrity of the cable connections
Motor restarts abnormally ESC Overheats	Possible RF Interference at the flying field.	The normal operation of the ESC may be susceptible to surrounding RF interference. Restart the ESC to resume normal operation on the ground to verify recurrence. If the problem persists, test the

		operation of the ESC at a different flying field.
	Inadequate Ventilation	Relocate the ESC to allow better ventilation
	Servos drawing too much current and over loading the ESC.	Use servos that are adequately sized for the ESC. The maximum BEC current drawn should be within the BEC limits.
	Over sized motor or prop	Reduce Prop size or resize the motor

This is a high power systems for RC model can be very dangerous and we strongly suggest that you read this manual carefully. we have no control over the use, installation, application, or maintenance of these products, thus no liability shall be assumed nor accepted for any damages, losses of costs resulting from the use of this item. Any claims arising from the operating, failure or malfunctioning etc. will be denied. We assume no liability for personal injury, property damage or consequential damages resulting from our product or our workmanship. As far as is legally permitted, the obligation for compensation is limited to the invoice amount of the product in question.